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CONNECTING DEVICE

The invention pertains to:

-- a connecting device for producing articulated connections between successive panels of a sectional door leaf, which device consists of a connecting element, which can be fastened to the successive panels, and of a carrier element designed to hold a guide element, which cooperates with a guide rail;

-- a sectional door leaf produced with the use of this type of connecting device; and

-- a process for installing a sectional door with a door leaf comprising a plurality of panels articulated to each other by the use of this type of connecting device.

Sectional doors are used as garage doors or industrial gates and are characterized in that, when the door is opened and closed, the sectional door leaf does not pivot outward into the area located in front of the space to be closed by the door.

This is achieved in that the door leaf of a sectional door, which can be moved along a path determined by a guide rail arrangement between a closed position, in which it is in an essentially vertical plane, and an open position, in which it is usually in an overhead horizontal plane, consists of a plurality of panels, arranged in a row extending along the predetermined path, these panels being connected to each other by joints with axes which are perpendicular to the predetermined path. These connecting elements which produce the articulated connections between the successive panels are usually designed as hinges, which are attached to the inside surface of the panels of the sectional door leaf, i.e., to the surface facing the interior space of the room to be closed by the sectional door leaf. The hinge flaps are attached by screws to adjacent panels. The rolled parts of the hinge, which make it possible to connect the two flaps pivotably to each other, can be seated at least partially in a recess formed between the adjacent panels, so that they project toward the outer surface of the door leaf. Installing the rolled parts of the hinges in this way makes it easier to avoid the formation of gaps between successive panels when the panels are traveling around the circular arc-shaped

section of the predetermined path and thus also offers protection against pinched fingers. In the case of the known sectional door leaves, this type of protection for the fingers is brought about in that a projection formed along the edge of one panel is accepted in a recess formed in the edge of an adjacent panel, i.e., the edge facing the projecting edge of the first panel. These types of sectional door leaves are described in, for example, EP 304 642 A1 and EP 370 376 A1. With respect to the design of the individual panels of a sectional door leaf and to the design of the guide rail arrangement of corresponding sectional doors, the disclosure content of these documents is herewith included in the present specification by explicit reference.

So that the door leaf can be guided between the closed position and the open position, guide elements, usually in the form of rollers, are attached to the successive panels of the sectional door leaf; these rollers cooperate with guide rails, which are installed permanently in the space to be closed, near the lateral edges of the door leaf. These guide elements are usually attached to the connecting elements, which are fastened to the lateral edges of the panels, where the longitudinal axis

of the guide element, i.e., the axle of the roller, is more-or-less parallel to the joint axis of the connecting element. To prevent the connecting elements from being overextended and thus the panels from being damaged during the movement of the door leaf between the open position and the closed position, the longitudinal axis of the guide element, i.e., the axle of the roller, is usually located as close as possible to the joint axis of the connecting element. To avoid an unnecessarily large number of components, the carrier element of conventional connecting devices of the type described above, i.e., the element which serves to hold the guide element on the door leaf, is formed by one of the hinge flaps of the connecting element. To this end, the hinge flap is designed with a U-shaped profile, the outer sidepiece of which has a hole, which serves to accept a retaining bolt or the axle of the guide element roller.

As already explained above, it is usually necessary for the longitudinal axis of the guide element, i.e., the axle of the roller, to be near the joint axis of the connecting element. The connecting element, furthermore, is usually attached to the panel in the immediate vicinity of the joint axis. This has the result of minimizing the mechanical loads exerted on the

connection between the connecting element and the panel, whereas it is possible at the same time to use the edge of the panel, which is usually reinforced, to achieve a secure attachment of the connecting element. The panel can be reinforced in the area of the edge adjacent to the joint axis by, for example, bending the edge of a sheet-metal panel back upon itself.

When sectional doors are installed with the use of these known connecting devices, the problem arises that, because of the proximity of the guide element to the joint axis, the guide element mounted on the connecting element interferes with access to the fastening elements used to attach the connecting element to the panel, inasmuch as these fastening elements are also in the vicinity of the joint axis. For this reason, the following sequence of steps is usually used to install a conventional sectional door: The first step is to install the guide rails required to guide the movement of the sectional door leaf in the room to be closed by the sectional door. The second step is to attach the connecting elements, designed as hinges, to the upper edge of the panel which is at the bottom when the door is closed. Third, the guide element is attached to the hinge flap which has just been attached to the panel; this flap is designed

with a U-shaped profile which serves simultaneously as the carrier for the guide element. Next, the guide elements attached via the carrier element to the panel are threaded into the guide rail arrangement, and the panel together with its guide elements is brought into the position it will occupy when the door is closed. The following panel is prepared in the same way by attaching the connecting elements and the guide elements to the upper edge, and, after the guide elements have been threaded into the guide rail arrangement, the panel is mounted on the previously threaded-in panel in the position it will occupy when the door is closed. The free hinge flaps of the connecting elements attached to the first threaded-in panel can then be attached to the lower edge of the panel which was threaded in next. In this way, the successive panels can be threaded in, one after the other, into the guide rail arrangement and hinged together until the complete door leaf has been assembled.

This installation process is usually very time-consuming, however, and therefore also expensive, because the guide rail arrangement must first be installed without the support of the door leaf, which could have served as an installation aid. As a

result, the mounting of the guide rail arrangement requires complicated measuring work, which must be performed with such accuracy that the individual panels of the door leaf will be guided smoothly by the guide rail arrangement both during the installation process and afterwards in normal operation.

In view of these problems of the state of the art, the invention is based on the task of providing a connecting device of the type described above which makes it possible to install sectional doors easily without any significant increase in the number of components and of providing a corresponding sectional door leaf and an installation process which can be implemented with the use of the inventive connecting device.

With respect to the device, this task is accomplished by an elaboration of the known connecting devices, which is characterized essentially in that, after the connecting element has been attached to the panel, the carrier element is attached to the connecting element in a preferably detachable manner.

This connecting device makes it possible to install sectional doors by a process in which, first, the successive panels of the door leaf are arranged in the wall opening to be closed by the door in a position corresponding to the closed

position of the door, so that these panels can be hinged to each other without interference from the guide elements. Second, the guide rails are attached with the help of the door leaf, which is already located in the opening and thus can serve as an installation aid. Finally, the carrier elements, in which the guide elements have already been mounted, are attached to the connecting elements, which have been attached previously to the panels. The carrier elements can be attached without an excessive number of components and yet still offer sufficient strength, because the connecting elements, which have already been attached to the panels, i.e., the fastening elements used to attach them, are available to add additional strength to the attachment of the carrier element. Overall, therefore, in spite of the two-part design of the inventive connecting device, the installation of sectional doors can be greatly simplified without a significant increase in the number of parts, because the connecting device designed according to the invention makes it possible to use the door leaf as an installation aid for the attachment of the guide rail arrangement, this being done in such a way that the guide elements mounted in the connecting device cannot interfere with the attachment of the connecting

elements of the inventive connecting device to the panels. These connecting elements, furthermore, can be attached at any desired location, which means that adequate mechanical stability can be ensured, and protection against pinched fingers, which may also be desired, can also be provided.

If the connecting element has at least one contact surface which can be laid against one of the panels and a fastening surface which is a certain distance away from this contact surface in a direction perpendicular to it, it will be possible to attach the carrier element of the inventive connecting device to the connecting element without any additional fastening elements by the use of a simple clamping method. Thus, after the contact surface has been attached to the panel, the fastening area of the carrier element can be inserted into the intermediate space formed between the panel and the fastening surface. The carrier element can be attached to the connecting element in this case by means of the screws which are used to fasten the connecting element, designed as a hinge, for example, to the panel. These screws have the effect of clamping the fastening area of the carrier element between the contact surface and the inner surface of the panel.

It has been found to be especially favorable for a first opening to be provided in the fastening surface and for a second opening to be provided in the fastening area. When the fastening area is inserted into the intermediate space formed between the fastening surface and the panel, these two openings can be brought into alignment with each other. As a result, an additional stabilization of the attachment of the carrier element to the connecting element can be achieved with the help of a fastening element, designed preferably as a screw, which can be passed through the two openings and, if desired, introduced into the panel as well.

As already explained above, the connecting element, possibly designed as a hinge, is advisably attached to the panel by means of screws. For this purpose, preferably at least one third opening is provided in the contact surface to accept a fastening screw.

The connecting element of an inventive connecting device comprises in general two parts, which can pivot with respect to each other around a joint axis, and each of which can be attached to one of the successive panels. So that the mechanical stability can be increased and advantage can be taken

of the reinforcements in the area of the facing edges of the successive panels, it is generally preferred, as already explained above, for the connecting element to be attached at a point near the joint axis. Therefore, the minimum of one third opening in the connecting element of an inventive connecting device is preferably located between the first opening and the joint axis. As a result of this offset between the minimum of one third opening and the first opening in the connecting element in a direction perpendicular to the joint axis, furthermore, it also becomes possible to attach the carrier element to the connecting element with the help of a screw passing through the first and second openings without interference from the guide element, which will usually be located near the joint axis. As also in the case of a conventional connecting device in which the hinge flap is designed as a carrier element, the carrier element of the inventive connecting device should also have at least one fourth opening, which is designed to accept a retaining bolt extending parallel to the joint axis, i.e., the corresponding axle of the roller serving as guide element. The two-part design of the inventive connecting device makes it possible to locate this

fourth opening with respect to the third opening in such a way that a plane which is perpendicular to the contact surface and parallel to the joint axis and passes through the minimum of one third opening also passes through the minimum of one fourth opening. As a result, the retaining bolt held in the minimum of one fourth opening will not interfere with the attachment of the connecting element to the panel, because the carrier element holding the guide element does not have to be attached to the connecting element until after the connecting element has been attached to the panel.

The retaining bolt of the guide element can be held very reliably in the carrier element by designing the carrier element as an essentially U-shaped profile in a cross-sectional plane parallel to the joint axis and perpendicular to the contact surface, where each of the two outer sidepieces of this profile has a fourth opening, and where the connecting sidepiece has a second opening. So that protection for the fingers can be obtained in the area of the inventive connecting device, it has been found advisable for a distance of more than 8 mm, preferably of more than 10 mm, and most preferably of more than 12 mm, to be maintained between the retaining element attached

to one of these parts or hinge flaps and the other part or hinge flap when the two hinged-together parts, i.e., the hinge flaps of the connecting element, are pivoted around an angle of approximately 60°.

As can be derived from the preceding explanation of inventive connecting devices, an inventive sectional door leaf comprises a plurality of panels arranged in sequence, which are connected to each other by the connecting elements of the inventive connecting devices, where the connecting device can be attached to one of the panels of the sectional door leaf by at least one fastening element, especially by a screw passing through the minimum of one third opening, and where this fastening element passes through a reinforced edge of the panel, especially a flanged edge.

In the inventive process for installing a sectional door with a door leaf comprising a plurality of hinged-together panels with the use of an inventive connecting device, the panels of the door leaf are first arranged in sequence one above the other and then hinged together by means of the connecting elements of the connecting device. Only after the guide rail arrangement has been attached with the use of the door leaf as

an installation aid are the carrier elements, on which the guide elements are mounted, attached to the connecting elements.

The invention is explained in greater detail below on the basis of the drawing, to which reference is expressly made with respect to all of the details which are essential to the invention but which have not been specifically discussed in the preceding description:

-- Figure 1 shows a top view of an inventive connecting device;

-- Figure 2 shows a cross-sectional view of the connecting device shown in Figure 1 along the cross-sectional line A-A indicated in Figure 1;

-- Figure 3 shows a side view of the connecting device illustrated in Figure 1; and

-- Figure 4 shows an end view of the inventive connecting device from the perspective of the arrow B in Figure 1.

The connecting device shown in the drawing consists essentially of a carrier element 10 and a connecting element 20, designed as a hinge. The connecting element 20 comprises two hinge flaps 22, 24, which are connected pivotably to each other by a hinge pin 26, which is held in the rolled parts formed at

the ends of these hinge flaps 22, 24. The hinge flap 24 of the connecting element 20 shown at the bottom in the drawing comprises a contact surface 24a, which can be laid against the inner surface of a panel of a sectional door leaf, and a fastening surface 24b, which is a certain distance away from the contact surface 24a in a direction perpendicular to that surface. The contact surface 24a and the fastening surface 24b are arranged in such a way that a fastening area 16 of the carrier element 10 can be pushed into the intermediate space formed between the fastening surface 24b and the panel resting against the contact surface 24a, as can be seen very clearly in Figure 2.

The fastening surface 24b of the hinge flap 24 also has an opening 28 in it, as does the fastening area 18 of the carrier element 10. These openings 18 and 28 are arranged in such a way that, when the fastening area is inserted into the intermediate space shown between the fastening surface 24b and the panel (not shown), they can brought into alignment with each other, as also illustrated in Figure 2. After they have arrived in this position, a fastening screw can be passed through the openings 28 and 18 and introduced into the panel which is resting against

the contact surface 24a. The carrier element 10 is thus attached very firmly to the connecting element 20. The hinge flap 24 has two additional openings 30, formed between the opening 28 and the joint axis formed by the hinge pin 26. These additional openings allow the hinge flap 24 to be attached to a panel of the sectional door leaf. The hinge flap 22 of the connecting element 20 also has two additional openings 23, each of which is designed as a slot. These openings allow the hinge flap 22 to be attached to the adjacent panel.

As shown with particular clarity in Figure 4, the carrier element 10 is designed with a U-shaped profile in a cross-sectional plane perpendicular to the contact surface 24a and parallel to the joint axis 26. The U-profile has two outer sidepieces 12, 14, and a connecting sidepiece 16, which connects the two outer sidepieces 12 and 14 to each other. The connecting sidepiece 16 serves as the fastening area. As shown especially clearly in Figure 1, the connecting sidepiece 16 of the carrier element 10 does not extend over the entire length of the carrier element. Although it starts at the edge facing away from the joint axis 26, it proceeds only part of the way toward the joint axis 26. After the hinge flap 24 has been attached to

the inner surface of a panel, therefore, the fastening area 18 can be pushed into the intermediate space formed between the fastening surface 24b and the inner surface of the panel without interference from the fastening screws passing through the openings 30.

As can be seen especially clearly in Figure 4, the edges of the outer sidepieces 12 and 14 facing the connecting sidepiece 16 are flanged over toward the inside, so that they can be pushed under additional fastening surfaces 32 provided on the hinge flap 24.

As can be seen in Figures 2 and 3, each of the outer sidepieces 12 and 14 has an opening 13, which serves to accept the axle of a guide roller. Although the drawing shows four possible locations for this opening, only one of these locations will actually be used in one retaining element. The distance between the opening in the carrier element and the panel increases progressively from the lowermost panel of the door leaf to the uppermost panel of the door leaf. There is thus a continuous increase in the distance between the guide elements and the corresponding panels. As long as the guide rail arrangement has been installed properly, the door leaf will

therefore be prevented, during the course of the opening and closing movements of the door leaf, from making sliding contact with the sealing strips located along the edges of the opening to be closed by the door leaf.

As can be seen clearly in Figures 2 and 3 in particular, the joint axis 26 is offset from the inner surface of the panel of the door leaf, i.e., the surface which can be laid against the contact surface 24a, toward the outside surface of the panel. This has the effect of reducing the danger of injury which might be caused by the projection of components of the connecting element into the interior space of the room to be closed by the sectional door leaf; in addition, the offset allows the panels attached to the hinge flaps 22, 24 to pivot in a way which prevents the formation of gaps, into which the fingers could be inserted and possibly pinched.

As can be derived from a comparative evaluation of Figures 1 and 2, the openings 13 in the outer sidepieces 12, 14 of the carrier element 10 lie in a plane which is perpendicular to the contact surface 24a and parallel to the joint axis 26 and passes through the openings 30. This means that the fastening elements for the hinge flaps 24 can also be located near the joint axis

26, as is the axle, which passes through the openings 13 and carries the roller, which cooperates with the guide rail arrangement (not shown in the drawing). The outer sidepieces 12, 14 of the carrier element 10 are shaped in such a way that, when the hinge flap 22 pivots with respect to the hinge flap 24 around an angle of 60°, a gap of more than 8 mm is maintained between them, in order in this way to avoid the danger that the fingers could get pinched in the area of the outer sidepieces of the carrier element.

The invention is not limited to the embodiment explained on the basis of the drawing. On the contrary, the connecting elements can also be used in situations where the joint parts attached to the successive panels are articulated together without the use of hinge pins. The carrier element can also be held in place exclusively by a clamping action between the fastening surface and the inner surface of the panel. In this case, the openings 18, 28 shown in the drawing can be eliminated. In addition, the shape of the outer sidepieces 12, 14 of the carrier element 10 can be different from that shown in the drawing.

CLAIMS

1. Connecting device for producing an articulated connection between successive panels of a sectional door leaf, which device consists of a connecting element (20), which can be attached to the successive panels, and of a carrier element (10) designed to hold a guide element, which cooperates with a guide rail, characterized in that, after the connecting element has been attached to the panel, the carrier element (10) can be attached to the connecting element (20), preferably in a detachable manner.

2. Connecting device according to Claim 1, characterized in that the connecting element (20) has at least one contact surface (24a), which can be laid against one of the panels, and a fastening surface (24b), which is a certain distance away from the contact surface in a direction perpendicular to it, where, after the contact surface (24a) has been attached to the panel, a fastening area (16) of the carrier element (10) can be inserted into the intermediate space formed between the panel and the fastening surface (24b).

3. Connecting device according to Claim 2, characterized in that the fastening surface (24b) has a first opening (28) and in that the fastening area (16) has a second opening (18), where these openings (18, 28) can be brought into alignment with each other when the fastening area (16) is inserted into the intermediate space.

4. Connecting device according to Claim 2 or Claim 3, characterized in that the contact surface (24a) has at least one third opening (30).

5. Connecting device according to Claim 4, characterized in that the connecting element (20) has parts (22, 24), which are connected to each other so that they can pivot around a joint axis (26), and in that the minimum of one third opening (30) is located between the first opening (28) and the joint axis (26).

6. Connecting device according to one of the preceding claims, characterized in that the carrier element (10) has at least one fourth opening (13), designed to accept a retaining bolt of the guide element, which is parallel to the joint axis (26).

7. Connecting device according to Claim 6, characterized in that a plane which is perpendicular to the contact surface (24a) and parallel to the joint axis (26) and passes through the minimum of one third opening (28) also passes through the minimum of one fourth opening (13).

8. Connecting device according to Claim 6 or Claim 7, characterized in that the carrier element (10) is designed essentially as a U-shaped profile in a cross-sectional plane parallel to the joint axis (26) and perpendicular to the contact surface (24a), where each of the two outer sidepieces of this profile has a fourth opening (13), whereas the connecting sidepiece (16) has a second opening (18).

9. Connecting device according to one of Claims 5-8, characterized in that, when the two parts (22, 24) pivot around an angle of approximately 60°, a gap of more than 8 mm, preferably of more than 10 mm, and most preferably of more than 12 mm, is maintained between the retaining element (10) attached to one of these parts and the other part (22).

10. Sectional door leaf with a connecting device according to one of the preceding claims.

11. Sectional door leaf according to Claim 10, characterized in that the connecting device is attached in one of the panels of the sectional door leaf by means of at least one fastening element, especially a screw, which passes through the minimum of one third opening.

12. Sectional door leaf according to Claim 11, characterized in that the fastening element passes through a reinforced edge of the panel, especially a flanged edge.

13. Process for installing a sectional door comprising a door leaf with a plurality of hinged-together panels with the use of a connecting device according to one of Claims 1-9, according to which:

(i) the panels are arranged in sequence one above the other;

(ii) the panels are connected to each other in an articulated manner by means of the connecting elements of the connecting device; and

(iii) the carrier elements, on which the guide elements are mounted, are then attached to the connecting elements.